tinued), by J. L. Schönn.—On a new simple condensation-hygrometer, by A. Matem.—On a general proposition of Herr Clausius in reference to electric induction, by G. J. Legebeke.—On an optical illusion in looking at geometrical figures, by W. Holtz.—Reflection and refraction of light on spherical surfaces, supposing finite angle of incidence, by F. Lippich.

American Journal of Science, May.—Outlet of Lake Bonneville, by G. K. Gilbert.—Chemical and geological relations of the atmosphere, by T. Sterry Hunt.—Archæan rocks of Wahsatch Mountains, by A. Geikie.—Apatites containing manganese, by S. L. Penfield.—New meteorite in Cleberne co., Alabama, by W. E. Hidden.—On the recent formation of quartz and on silicification in California, by T. S. Hunt.—The Uranometria argentina, by H. A. Newton.—The Ivanpah, California, meteoric iron, by C. U. Shephard.—The atomic weight of antimony (preliminary notice of additional experiments), by J. P. Cooke.—Daubrée's experimental geology, by J. Lawrence Smith.—Bastnäsite and Tysonite from Colorado, by O. D. Allen and W. J. Comstock.—On argento-antimonious tartrate (silver emetic), by J. P. Cooke.—The sternum in Dinosaurian reptiles, by O. C. Marsh.—On the southern comet of February, 1880, by B. A. Gould.

Proceedings of the Boston Society of Natural History, vol. xx., part 3 (published April).—Dr. Sam. Kneeland, the mineralised phosphatic guanos of the equatorial Pacific Islands; on the frozen well at Decorah, Iowa.—Prof. Brewer, additional notes on his lists of New England birds; catalogue of humming-birds in the Society's collection (only commencement).—Prof. Shaler, on the submarine coast shelf.—Dr. Wadsworth, on danalite from the iron-mine, Bartlett, N.H.; on picrolite from a serpentine quarry in Florida, with analysis by W. H. Melville.—J. H. Huntington, on the iron ore of Bartlett, N.H.—Dr. Fewkes, on *Rhizophysa filiformis*, with a plate; on the tubes in the larger nectocalyx of *Abyla pentagona*, with a plate.—Prof. E. Morse, on the antiquities of Japan.—F. W. Putnam, on chambered mounds in Missouri; on some explorations in Tennessee, with remarks on some bones of N.E. Indians; on the ornamentation of some aboriginal American pottery.—Dr. Hagen, on a new species of Simulium with a remarkable Nympha-case—W. O. Crosby, on evidences of compression in the rocks of the Boston basin.—Dr. W. K. Brookes, development of the digestive tract in molluscs.—S. H. Scudder, probable age of Haulover Beach, Nantucket Harbour.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 27.—"On the Relation of the Urea to the Total Nitrogen of the Urine in Disease," by W. J. Russell, Ph.D., F.R.S., and Samuel West, M.B., Oxon.

In the valuable series of papers upon the excretion of urea, communicated by Prof. Parkes to the Royal Society, he showed that in health 90 per cent. of the nitrogen in the urine was eliminated in the form of urea. It seemed to us of considerable interest and importance to ascertain whether in disease this statement still held good, or whether, as indeed seemed probable, under altered conditions, nitrogen might not be excreted in some other form. With the view of determining this point, the following experiments were undertaken.

The cases upon which the observations were made fall into two groups—the first, a series taken at random from the hospital, the patients suffering from various diseases, and being under various conditions as regarded diet, muscular exertion, &c. In the second series, the patients were healthy, and placed under conditions as far as possible constant, the amount of diet being fixed, and the patients at absolute rest.

The first series, consisting of twenty-three observations, falls into several small groups. The relation of the urea-nitrogen to the total nitrogen was, in all cases, calculated out in percentage amounts (the total nitrogen being taken as 100), and the mean of each group of observations given.

The first group consists of six cases of pneumonia, and in these the urea-nitrogen represents 90 per cent. of the total nitrogen.

The second, of two cases of jaundice, with two determinations in each. The mean of the first giving 85·7 per cent.; of the second 90·2 per cent.

The third, of two cases of albuminuria, in which the mean is 86 per cent. In these observations the albumen was previously precipitated and removed. In a third case the determination was made without previously removing the albumen. In this latter, the percentage was 63·6.

The fourth group consists of a collection of cases of various kinds. One of pyæmia, one of typhoid fever, rheumatic fever, acute dysentery, pleurisy, hepatic abscess, and leucocythæmia, two of erysipelas, and two of diabetes, making eleven in all. The mean percentage of them all is 93·8.

The lowest percentage in this first series is found in the cases of albuminuria and of jaundice, a fact of interest as bearing upon the place of production of urea.

The second series consists of eighteen determinations made upon three cases, in which the diet was fixed and the patient in a condition of absolute rest.

These give a mean of 90·1 per cent. The mean of all the cases in the two series is 89·3, or, if the cases of albuminuria and jaundice be excluded, 91·3 per cent., and this agrees almost exactly with the results of Prof. Parkes' experiments, in which the mean arrived at is 91 per cent.

We may therefore assume that the urea-nitrogen may be taken as the measure of the total nitrogen, and that this may be approximately determined by adding 10 per cent. to the amount of urea-nitrogen.

This is, however, only true if the mean of a large number of observations be taken, for there is no fixed relation between, on the one hand, the amount of the urine and the amount of the solids in it, or on the other, between the amount of the various solids *inter se*.

The result, then, of our observations is to prove that the chemistry of the urine remains essentially the same in disease as in health, and that the generalisation of Prof. Parkes is true in either case. The urea may therefore be safely regarded as the measure of the total nitrogen, and as forming 90 per cent. of it.

"On the amount of Nitrogen excreted by Man at rest," by Samuel West, M.B. Oxon, and W. J. Russell, Ph.D., F.R.S.

The three patients, the subjects of this investigation, were all placed under the conditions of the most absolute rest, not being allowed to sit up in bed, or even indeed to feed themselves. Their diet was reduced till it was found that their health was suffering, and then increased until a condition was reached, which may be called one of "clinical equilibrium," when the health, so far as could be determined clinically, was perfect.

The patients were all suffering from the same affection, viz., aneurism, a disease which produces mechanical rather than constitutional symptoms, and in these cases, so long as the treatment was carried on, produced no symptoms at all, so that for all practical purposes the patients may be regarded as healthy men.

The condition of clinical equilibrium being reached, the amount of nitrogen in the food was determined by direct analysis.

In two of the cases the diet consisted of 10 ozs. of solids and 10 ozs. of liquids.

By calculation from Parkes' tables, this should yield 6·3 grms. of nitrogen. Analysis gave a somewhat higher number: in the first determination 7·07, and in the second 6·95.

In the third case the diet was 8 ozs. of solids and 8 ozs. of liquids, distributed in the same proportion. This by calculation from the preceding analysis should give about 5·6 grms. of nitrogen.

Comparing now the amount of nitrogen ingested in the food with the amount obtained from the urine, we find:—

	Nitrogen ingested.		Nitrogen in urine.
Case I.	7·0	...	8·6
,, II.	7·0	...	8·64
,, III.	5·6	...	6·4

In all the cases the amount in the urine is in slight excess of that in the food, so that we may fairly regard all the nitrogen here obtained as representing tissue waste, for there was no surplus in the food to increase the amount in the urine.

We obtain as the mean of these three cases $\frac{23·64}{3} = 7·87$, or approximately 8 grms., which we therefore are justified in regarding as the minimum amount of nitrogen a healthy adult man excretes per diem. This is equivalent to 17 grms., or 260 grains of urea.

It is interesting to compare with these observations the results obtained by the other methods of the investigation above referred to.

Ranke repeated upon man the experiments which Bischoff and

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Voit had conducted upon the dog, and among them are two series of observations which illustrate the subject at present under consideration.

In the first no food at all was given, and the patients were kept at rest.

In one case 8 grms. of nitrogen were passed, in a second 10, and in a third 8·6. In a fourth case the amount was as low as 6. And in another series of observations upon himself, Ranke found the amount passed in two starvation days to be 8 and 8·6 grms.

Nicholson made three estimations in the case of starving prisoners, and found as the mean of three days 8·6 grms.

Many other observers have noticed the rapid fall in the amount of nitrogen excreted during starvation.

But the short duration of these experiments makes it probable that the minimum was not reached.

We have then 8 grms. as the mean of the only reliable determination at our command of the nitrogen excreted in the urine during starvation.

Prof. Playfair attacked the question from another side, by collecting from various sources the minimum diets upon which man could live, and to which he gave the name of subsistence diets, and by calculation the amount of nitrogen contained in them. This method gave him as a mean 9·2 grms., but his patients were none of them at absolute rest, but were performing during the day a certain amount of work. Edward Smith in the same way, by calculation from the diets of the spinners during the cotton famine, found a somewhat larger amount of nitrogen (12 grms.), which agrees with the amount of nitrogen contained in Playfair's second class of small diets, but in all these cases the effect of muscular exertion is not eliminated.

Unruh gives a series of three observations upon hospital patients kept at rest and placed upon a restricted diet.

In the first, a case of cancerous obstruction, the amount of nitrogen was 8 grms. (17·5 urea). But this case is not altogether satisfactory, from the amount of wasting accompanying this disease.

The other two were cases of syphilis placed upon fever diet, and kept at rest for the sake of the experiments; the first passed 8·6 grms. (18·6 urea), the second 7·5 grms. (16·2 urea).

The mean of these three cases is 8 grms. (17·5 urea).

The general results of the various series of observations may be roughly tabulated thus:—

I. Starvation. 8 grms.
II. Non-nitrogenous food. 8 grms.
III. Subsistence diet. 9 grms.
IV. Insufficient diet. 8 grms.
V. Clinical equilibrium. 8 grms.

A remarkable coincidence, considering the variety of the methods employed and the different conditions under which the determinations were made.

We may therefore conclude that the minimum amount of nitrogen excreted by a healthy adult man is on the average 8 grms. in the twenty-four hours, this being equivalent to 17·5 grms., or to 260 grains of urea.

Geological Society, June 9.—Robert Etheridge, F.R.S., president, in the chair.—John Burn Anstis du Sautoy and Rev. John Cowley Fowler, B.A., were elected Fellows; Prof. G. Dewalque, Liége, a Foreign Member, and Prof. Leo Lesquereux, Columbus, U.S., a Foreign Correspondent of the Society.—The following communications were read:—On the occurrence of marine shells of existing species at different heights above the present level of the sea, by J. Gwyn Jeffreys, F.R.S., Treas. G.S. This paper resulted from the author's examination of the mollusca procured during the expeditions of H.M.SS. *Lightning* and *Porcupine* in the North Atlantic. He stated that he found several species of shells living only at depths of not less than between 9,000 and 10,000 feet, which species occurred in a fossil state in Calabria and Sicily at heights of more than 2,000 feet, such depths and heights together exceeding the height of Mount Etna above the present level of the Mediterranean. He then gave an account of the post-tertiary deposits in Europe, Asia, and North America, to show their various heights, and especially of the raised beach on Moel Tryfaen in Caernarvonshire, which was from 1,170 to 1,350 feet high. Some of the shells in that deposit were boreal, and did not now live in the adjacent sea. The author stated that no shells of a peculiarly northern character had been noticed in the west or south of England. He then questioned the permanence and even the antiquity of the present oceanic basins, from a consideration not only of the fauna which now inhabits the greatest depths, but also of the extent of oscillation which had prevailed everywhere since the Tertiary period. A complete list of the Moel Tryfaen fossils was given, to the number of sixty, besides three distinct varieties, of which number eleven were Arctic or northern, and the rest lived in Caernarvon Bay. All of these fossils were more or less fragmentary.—On the pre-Devonian rocks of Bohemia, by J. E. Marr, B.A., F.G.S. The author commenced with a brief notice of the pre-Cambrian rocks, which are gneisses and schistose limestone with intrusive eclogite; over these lie unconformably green grits, ashes, breccias, hornstones (étage A of Barrande), which the author considers to represent the Harlech group of Wales. Étage B is unconformable with this, but conformable with C, which contains the "primordial" fauna. D contains the colonies. E to H are Silurian, and more calcareous than those underlying them. The base of the group is unconformable with those beneath. The lithological characters of the various beds were described. The following are the associated igneous rocks:—Granite, quartz feltzite, porphyrite, mica-trap, diabase, diorite, eclogite. Of these brief descriptions were given. The author gave a comparison of the various shales with English deposits. The pre-Cambrian series much resemble the Dimetian and Pebidian of Wales, the latter being étage A; étage B, the Harlech; étage C, the Menevian, probably a deep-water deposit, as is indicated by the abnormal size of the eyes of its Trilobites; the lowest bed of étage D probably represents part of the Lingula flags of Britain. D, *α*, 1, *β*, seems to represent the Tremadoc shale of Britain, and, like it, contains pisolitic iron-ore. Representatives also of the Arenig and Bala beds are found. A slight unconformity marks the base of the Silurian. Three graptolitic zones occur. The lowest, or *Diplograptus* zone, identical with the Birkhill shales, contains thirteen species of graptolites; the next, or *Priodon* zone (four species) resembles the Brathay flags; the upper, or *Colonies* zone (five species), resembling the Upper Coldwell beds of the Lake-district. Above these follow representatives of Wenlock, Ludlow, and probably of the Passage beds. The author, with the evidence of these, discussed the "colonies" theory of M. Barrande, pointing to the non-intermixture of species, notwithstanding the irregular repetition of the zones, the non-occurrence of these colony species in intermediate beds, and other reasons. The stratigraphy and palæontology of several of these colonies were discussed in detail, showing it to be more probable that their apparent intercalation with latter faunas is due to repetition by faulting.—On the pre-Cambrian rocks of the North-Western and Central Highlands of Scotland, by Henry Hicks, M.D., F.G.S. The author, after examination, considers the rocks of the following districts to be wholly or in part pre-Cambrian:—(1) *Glen Finnan, Loch Shiel to Caledonian Canal;* (2) *Fort William and Glen Nevis;* (3) *Ballachulish, Glen Coe, and Black Mount;* (4) *Tyndrum to Callander.* The author states that the Silurian (and Cambrian) rocks flank the pre-Cambrian in lines from north-east to south-west, and overlap Ben Ledi on the south side. Thus here, as elsewhere, subsequent denudation has removed enormous masses of the more recent rocks, only here and there leaving patches of these in folds along depressions in the old pre-Cambrian floor.

EDINBURGH

Royal Society, May 17.—Mr. D. Milne Home, vice-president, in the chair.—Mr. J. B. Haycraft, M.B., B.Sc., read a paper on a method for the quantitative estimation of urea in the blood. The method depended upon the fact that one can dialyse the fluid parts of blood into alcohol, into which the urea passes in a very pure form. The alcohol containing the urea is evaporated, the residue washed with petroleum ether, re extracted, and estimated after the method of Huefner. This method yields urea from so small a quantity of blood as 10 cc., and shows that more is present than was formerly conjectured, there being on an average 35 parts per 100,000.—Mr. Patrick Geddes, in his paper on the phenomena of variegation and cell-multiplication in a species of Enteromorpha, pointed out that the development of colourless cells in this alga was by a process of budding into the intercellular spaces between the coloured cells, so that both kinds of cell-multiplication, by fission and by budding, were exemplified in the same plant.—Prof. Tait gave a communication on the accurate measurement of high pressures. For pressures up to a few tons the behaviour of nitrogen had been thoroughly investigated (at least at one temperature). By comparison with a nitrogen compression gauge, a scale could be

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constructed for a pressure gauge registering by the compression of the walls of a thinnish glass cylinder containing mercury; and this scale could be applied as long as the limits of elasticity, as defined by Hooke's law, were not exceeded. To determine when these limits were being approached, a similar glass cylinder with thicker walls was to be compared with the former one, which would be the first to deviate. This second gauge, with its higher limits of elasticity, could then be used for the higher pressures; and when its indications began to deviate from Hooke's law, a third and still stronger gauge could be substituted, its constants having been determined similarly by comparison with the second gauge. And thus a series of graduated gauges could be constructed to measure extremely high pressure; and at length when the pressure was such as to crush glass, a steel gauge constructed on somewhat similar principles could be substituted, being graduated first by comparison with the strongest glass gauge. Thus accurate measurements of high pressures could be obtained up to the point at which the compressing apparatus itself would begin to give way.—Mr. D. Milne Home, as convener of the Boulder Committee, presented the sixth report, and gave a notice of its chief features.—Prof. Turner exhibited a curious collection of natural masks and skulls from New Guinea and neighbouring islands.

VIENNA

Imperial Academy of Sciences, April 15.—Observations on the deadening of torsion oscillations by internal friction, by Dr. Klemencic.—Studies on the decomposition of simple organic compounds by zinc powder; I. alcohols, by Prof. Ludwig.—On the action of some metals and metalloids on phosphorus oxychloride; and the existence of Leverrier's phosphoric oxide, by H. H. Renitzer and Goldschmidt.—On the saltness of water in the Norwegian North Sea, by Herr Tornöe.—New methods of finding mean geometric proportions, by Herr Zimels.—On the former and present position of geology and geogony, and the methods of research in these directions, by Dr. Boué.—Geological observations in Southern Calabria, by Dr. Burgenstein and Herr Nöe.—Radiant electrode-matter, by Dr. Puluj.

PARIS

Academy of Sciences, June 14.—M. Edm. Becquerel in the chair.—The following papers were read:—On papaïne; contribution to the history of soluble ferments, by M. Wurtz. Alcohol precipitates from the juice of *papaya*, a principle of variable composition, but, when purified by dialysis, approximating to albuminoid matters. Papaïne purified with subacetate of lead has the composition and characters of such matters. The rapid liquefaction of fibrine by papaïne may occur in presence of prussic, boric, or even carbolic acid (conditions excluding microbes).—Geological history of the English Channel (second part), by M. Hébert.—Craniology of African negro races; non-dolichocephalic races, by M. de Quatrefages. The ninth volume of the "Crania Ethnica" finishes the account of negro races, and enters on the yellow or Mongolic races. M. Hamy finds in Africa that not only in individuals, but in entire populations occupying considerable spaces, and in some instances extending through about four-fifths of the Continent from east to west, there is an absence of dolichocephaly. One portion of these, marked also by small stature, are sub-brachycephalic generally, but sometimes reach brachycephaly; M. Hamy calls them Negrillos. He characterises various races that have hitherto been confounded.—New experiments on the resistance of Algegerian sheep to spleen-disease, by M. Chauveau. The twelve European sheep tested all died after a single inoculation. Of forty-seven Algerian sheep, thirty-nine proved resistant after repeated inoculations.—M. Stas was elected Correspondent in Chemistry in room of the late M. Zinin.—On the value of gravity at Paris, by M. Peirce. He considers (from certain corrections) that the value hitherto given should be increased by one-ten-thousandth.—Determination of a function with only one variable, in a given interval, according to mean values of this function and of its successive derivatives in this interval, by M. Leauté.—On the resolution of the equation $x^n + y^n = z^n$, in whole numbers, by M. Lefébure.—Experimental researches on magnetic rotatory polarisation in gases, by M. Henri Becquerel. The memoir presented relates chiefly to various small corrections in his direct measurements, the most important being due to influence of magnetism on the glass closing the tubes. For the gases nitrogen, carbonic acid, protoxide of nitrogen, and olefiant gas (not for oxygen), he finds the magnetic rotations for rays of different wave lengths nearly in inverse ratio of the square of the wave-lengths as for non-magnetic solid bodies and liquids. The intimate connection of the rotation with the refractive index is shown. Oxygen, curiously, gives with red rays a rotation a very little above that with green (in the other gases the deflection is greater for green rays in the ratio of about 1·50). This may be connected with the very magnetic character of oxygen.—On the constancy of the proportion of carbonic acid in the air, by M. Schlœsing. He calculates that the sea holds in reserve a quantity of CO_2 disposable for exchange with the air ten times greater than the whole quantity in the atmosphere, and much greater, *a fortiori*, than the variations of this quantity; hence a strong regulative action on the amount of aërial CO_2.—On causes which tend to warp the girders of iron bridges and means of planning these girders so as to resist warping influences, by M. Périssé.—On the transcendants which play an important part in the theory of planetary perturbations, by M. Darboux.—M. Gaugain's death was announced.—On the figure of the planet Mars, by M. Hennessy.—On the equivalence of forms, by M. Jordan.—The tensions of saturated vapours have different modes of variation according as they are emitted above or below the point of fusion, by M. De Mondesir.—Action of bromide of methyl and of iodide of methyl on monomethylamine, by MM. Duvillier and Buisine.—On the transformation of terebenthene into cymene, by M. Bruère.—Preparation of indoline and its compounds, by M. Giraud.—On the existence of a lymphatic circulation in *Pleuronectes*, by M. Jourdain. The appearances in *Platessa vulgaris*, Cuv., and *Plat. flesus*, Cuv., are described. There are vessels which convey the lymph to peripheric parts, and others which bring it to a central reservoir. Also, the lymph seems to be aërated in vessels in the branchiæ. The lymph-reservoir has no intrinsic muscles (to effect the circulation), but the fibres acting on it seem to belong to the respiratory apparatus.—On the physiological action of *Thalictrum macrocarpum*, by MM. Bochefontaine and Doassans. *Thalictrine*, the active principle of this plant (found in a certain part of the Pyrenees), acts first on the central encephalo-medullary nervous system, then on the heart, arresting the functions; it affects nervous excito-motricity, and diminishes muscular contractility. It resembles aconitine, but is not so active.—On the micrographic analysis of water, by M. Certes. He treats water with a 1·5 per cent. solution of osmic acid (1 cc. of this to 30 to 40 cc. of water); the acid kills any organisms present without deforming them; they sink to the bottom and may be examined microscopically. Some colouring reagents mixed with dilute glycerine may also be used.—On the place of formation of adventive roots of monocotyledons, by M. Mangin.

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